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Chapter 6

Market Effects of Naval Presence in a Globalized World: A Research Summary

Robert E. Looney

What are the economic benefits of the peacetime operations of the U.S. Navy? Over the years, that has been one of the more elusive questions posed to and by the Navy. Today's phenomenon of globalization makes the question even more pertinent, and this initial question can be extended to ask: What is the impact of these economic benefits on globalization? Since naval forward presence (also known as forward engagement or, simply, naval presence) is the dominant mission of peacetime naval operations, a starting point would be the examination of the economic benefits to the United States and allied countries provided by U.S. naval forward presence. Forward presence is presumed to enable timely crisis response. But while most authorities on the subject contend that these benefits are significant, their measurement has always been fraught with conceptual and computational difficulties. The greatest difficulty has always involved developing a convincing counterfactual—what would the state of affairs have been in the absence of forward deployed naval forces?

The purpose of this chapter is to provide a taste of the research being conducted at the Naval Postgraduate School in identifying and measuring the economic benefits of naval forward presence. This chapter briefly summarizes two previous studies that identify the levels of economic benefit and provides details of a third, more recent study that attempts to tie the benefits of forward presence to the globalization phenomenon (as reflected in the collective impact on groups of countries with differing levels of economic globalization). The chapter does not attempt to replicate the methodology of the first two studies and argue their merit—indeed, that has been done elsewhere.

¹ Readers interested in challenging the validity of our findings on the levels of economic benefits to the United States and its allies (reflected in oil futures and market indices) achieved by forward presence are referred to the two study reports themselves. Rather, this chapter introduces the argument that: the greater the level of integration into the global economy for any state, the greater is the beneficial impact of U.S. naval forward presence on its economy.²

Development of a Methodology: Effects on Oil Futures

The issue of how to quantify the economic benefits of naval forward presence came to the fore in preparing for the Congressionally mandated 1997 Quadrennial Defense Review (QDR). Early in that process, Navy leaders asked if the economic benefits of forward engaged naval forces could be quantified and thereby communicated to policymakers. Until this point, the only evidence of such benefits was anecdotal.³ At that time the Naval Postgraduate School was asked to develop new methodologies directed toward the quantification of these benefits.

In our initial study of this issue (1997), we developed a methodology focused on the effects of naval forward engagement and crisis response on world oil prices, as reflected by oil futures markets.⁴ Using a vector autoregression econometric model,⁵ this approach linked the oil price effects associated with naval forward engagement and crisis response to changes in major economic indicators.

This methodology was then applied to three cases of naval forward engagement and crisis response: the opening stages of Operation *Desert Shield* (1990 Gulf War); the Iraq-Kuwait border incident of October 1994; and the January 1987 Gulf shipping crisis (reflagging of Kuwaiti tankers and defense of other shipping during the Iran-Iraq war). These crises varied in terms of the military threat posed to U.S. and allied interests, oil market conditions, business cycles, and the general world economic climate. But a clear trend emerged from the analysis of each incident. When oil futures markets become aware of naval forward engagement/crisis response, oil prices decline.

By stabilizing and lowering prices in oil futures markets during these crises, naval forward presence provided significant benefits to the U.S. economy. These benefits can be measured in terms of dollar losses that would have occurred in the absence of timely crisis response facilitated by naval presence. Conservative estimates (all in 1997 dollars) indicate that naval crisis response in the opening stages of *Desert Storm* provided \$55.22 billion worth of economic benefits (in terms of gross domestic product [GDP]) to the United States. Similarly, naval forward engagement during the 1994 Iraq-Kuwait border incident yielded \$7.13 billion in benefits, while naval forward engagement during the 1987 Gulf shipping crisis produced \$5.01 billion in benefits. Naval forward engagement and crisis response had a positive impact not only on the U.S. economy but also on the economies of America's allies. Naval crisis response in the opening stages of *Desert Storm* alone is likely to have provided up to an \$86.8 billion increase in world income (in terms of GDP).

Several major findings emerged from the initial study:

- ✧ Most important, it is possible to develop procedures to quantitatively measure some of the economic impacts of naval forward presence.
- ✧ Economic impacts can be measured in terms of dollar cost savings and/or additional dollar resources available to the economy.
- ✧ These economic impacts can be significant. They may also persist over a fairly long time period and across the economies of a large number of U.S. allies.
- ✧ While these initial estimates of the economic benefits associated with naval forward presence may appear high, it is also apparent that they actually underestimate the complete benefits associated with crisis response—one simply cannot put a hard figure on the total benefits from avoidance of the crises prevented by the forward presence of the Navy.

The 1997 study concluded that economic benefits associated with naval forward engagement in the Gulf region would most likely outweigh the actual financial costs associated with these operations. Given the nature of oil markets and the volatility of the region, it is safe to assume that naval forward engagement probably would continue to yield significant economic gains in the future.

Methodological Issues

The main difficulties in estimating the economic benefits derived from naval

forward presence and crisis response are in establishing a credible counterfactual argument and a meaningful measure of impact. Specifically, what would have been the state of the U.S. economy if naval forces had not responded to the crisis at hand? Given that naval forces did respond, what is the relevant measure to capture the economic impact associated with this response?

Both problems are fraught with a number of conceptual issues that need to be resolved before the calculation of economic benefits can be undertaken. First, by their nature, crises tend to have a negative impact on markets and economic activity. Forward engaged naval forces are often the first to respond to a crisis, and their arrival on scene usually has a stabilizing political influence. The stabilizing influence extends to economic activity as well. Oil appears to be the most tractable vehicle for analyzing the economic benefit of naval forward presence and crisis response. Because oil is essential to nearly all economic activity in the industrialized world, price movements of that commodity in reaction to world events provide a useful index of the overall economic impact of international crises and of the response of naval forces to them.

Second, it is essential to select an index capable of reflecting the market's interpretation of the severity of a crisis as well as the degree to which trader confidence is restored following the response of naval forces to a crisis. Because oil futures prices provide more information than spot prices, the first study uses futures prices to explore the effect of naval forward presence and crisis response. Oil futures markets serve as an efficient substitute for the bulk storage of oil. Instead of stockpiling oil reserves, futures markets such as the New York Mercantile Exchange allow companies to purchase contracts to buy or sell oil at some future time. These contracts are transacted for individual months in the future. Traders base their offers on the best economic, political, and military information available to them at the time the contract is traded. As a result, futures prices are considered to be the most unbiased estimate of the likely spot or daily price of oil when the contracted delivery date actually arrives.⁶

Of course, one still has great difficulty in arguing convincingly that changes in oil prices or other key economic variables during a period of crisis were due in large part to the movement of naval forces from forward presence positions. Even though a clear pattern seemed to exist between crisis response and oil price movement in our earlier cases in the Gulf, the strongest arguments making this link had to rely largely on the process of elimination; that is, no other credible events could have produced the observed pattern of oil prices.

A way to overcome this difficulty is to examine effects on other markets concerned with safety of supplies, access to raw materials, and future economic conditions. With increased globalization and the increased interlinking of markets, it is clear that naval actions are likely to affect exchange rates, share values, and a whole host of related commodity indexes. Associated movements in these markets are also likely to affect the U.S. economy. Specifically, associated movements in one or more of these markets may enhance the positive impacts of naval actions or, conversely, offset the oil-derived benefits. For example, although naval crisis response often lowers oil prices, it may simultaneously weaken the yen, providing Japanese exporters with a competitive edge in the U.S. market. Subsequently, increased imports and associated loss of jobs could conceivably offset all of the benefits derived from lower oil prices.

Beyond the Gulf: Association between Naval Events and Markets

With the methodological issues in mind, a second study (2000) was undertaken to address the limitations of the first, while at the same time strengthening and extending our basic methodology. The new elements included the use of a highly objective statistical analysis (cointegration, error correction) capable of quantifying the short- and long-run impacts of naval movements on oil prices;⁷ and the analysis of new cases of naval forward presence/crisis response. Cases were selected to provide our sample with greater geographical diversity and market impact. In addition, care was taken to assure that these cases involved primarily naval units, with at best limited participation from the other services. Four new cases were selected:

- ✧ The Taiwan Strait crisis (1996) was selected because of its importance and also the fact that it did not appear to involve oil markets.
- ✧ Operation *Desert Strike* (1996) was chosen to see if a crisis of very short duration involving naval forces was capable of altering oil markets in a manner that resulted in a significant impact on the U. S. economy.
- ✧ Operation *Desert Fox* (1998) was selected because it represents a case where there was great uncertainty in oil markets concerning both Iraq's intentions and the consequences of naval actions.
- ✧ Libyan operations (1986) were chosen because they represented a time in which oil markets were first developing sophisticated forward markets. They also represent a case close to Europe and thus possible links to exchange and share markets.

The core task for this major extension of our earlier model was to design a method for statistically linking naval actions and other events to price movements in key markets. As noted above, our earlier study made this key connection largely through the process of elimination. In the second study, formal event analysis provides a true statistical test of the association of naval actions and markets. It can also be used for hypothesis testing. Specific questions were asked throughout the study: Do naval actions increase market uncertainty, or do they provide a stabilizing impact? Do naval actions produce only a transitory movement in market prices, or are these actions responsible for longer run adjustments in these markets? If the latter is the case, the credibility of the forward market analysis outlined above is strengthened in that the consequences of naval actions are not confined to the short-run up-and-down fluctuations of spot prices. Instead, these actions actually set in motion a whole series of economic adjustments that, taken as a whole, provide significant economic benefits.

While oil markets were the one constant throughout the cases, several other markets were affected by naval actions. These include: the dollar/yen exchange rate, the Commodity Research Bureau commodity index, the Goldman-Sachs commodity index, the Standard and Poor 100, the Nikkei 100, the Hang-Seng, and the New York Stock Exchange composite index. In each case involving oil or commodity markets, naval events reduced the price from what it would have been in the absence of forward presence/crisis response. In the case of share markets and the dollar/yen exchange rate, prices were higher than they would have been if naval forces had not been present.

In affecting these markets, naval events were shown to produce a short-run (overnight) effect in the directions noted above. More important, the analysis found that the impact of naval events on these markets lingers for a significant time,

altering prices for a period of time that allows for significant benefits to the United States economy. These benefits were considerable, with each operation yielding well over \$1 billion of added GDP to the U.S. economy.

Assessing Future Effects: Oil Price Shocks as Measures of Globalization

The conclusions noted above can be the basis for assessing future economic impacts associated with naval forward presence/crisis response. But can we predict in advance the general magnitude of economic benefits accruing from similar operations? What methods are best to do this? What factors need to be taken into account? How might these change with the evolution of globalization and increased economic integration? Will these changes in the international economic environment likely strengthen or weaken the positive economic impacts associated with naval forward presence/crisis response?

Addressing these issues requires us to develop an integrated framework for assessing the consequences of globalization on the market forces associated with naval forward presence/crisis response. Here we need to draw heavily on the rapidly expanding literature on globalization, integrating it with our quantitative findings on economic benefits. Focus is on the key linkages between naval forward presence, oil prices, and globalization. Has globalization over time strengthened or weakened this link? What elements of globalization have been most important in this regard? Are these trends likely to continue into the foreseeable future?

In our third study (2001), the linkages between naval forward presence/crisis response and oil prices are examined in the context of changes in the global economy and the various dimensions of globalization. An operational procedure is developed to measure the various facets of globalization and track their movements over time. Next, the magnitude of oil price shocks' effect on domestic economies is shown to depend critically on the global environment in which they occur. Several groups of countries are identified by the manner in which oil shocks reduce their national incomes. Because of trends in globalization, the first group of advanced countries—including the United States—has become more vulnerable over time to oil price shocks. That is, oil shocks of a given magnitude have tended over time to produce greater and greater reductions in GDP. The second group of countries, consisting largely of the top layer of developing countries led by Mexico, South Africa, and South Korea—is also affected by globalization, but to a lesser extent. While GDP is still reduced by oil price shocks in these countries, globalization appears to have been less of a factor.

In short, the main finding of the third study is that naval forward presence plays an increasingly important role in stabilizing the economies of the advanced industrial nations. Other parts of the world also benefit, although trends in globalization suggest that, for them, the economic gains that accrue from naval forward presence are of a lower magnitude.

Categorizing Globalization

Current debates over the relative merits of globalization provide some insight into the manner in which market price modifications brought about by naval forward presence impact on the economies in different parts of the world. In a recent article, Nobel Prize winner Amartya Sen of Cambridge University provides some basic

answers to several of the key elements of this debate—answers that have relevance to the changing economic impact of naval forward presence. Sen maintains:

- ✍ Globalization is not new, nor is it just Westernization: Over thousands of years, globalization has progressed through travel, trade, migration, spread of cultural influences and dissemination of knowledge and understanding (including science and technology).
- ✍ Globalization is not in itself a folly. It has enriched the world scientifically and culturally and benefited many people economically as well. In this regard, modern technologies as well as economic interrelations have been influential.
- ✍ The use of the market economy can produce different outcomes. Specifically, the market economy can generate many different results, depending on how physical resources are distributed, how human resources are developed, what rules prevail, and so on in all these spheres, and the state and the society have roles, within a country and in the world.
- ✍ The world has changed since the Bretton Woods agreement. The current economic, financial, and political architecture of the world (including the World Bank, the International Monetary Fund, and other institutions) was largely set up in the 1940s, following the Bretton Woods Conference in 1944. The implication is that the current system does not have institutions that are responsive to many of the changed economic circumstances, and, as such, many parts of the world are not well served by the current system.⁸

Sen suggests that various parts of the world have evolved somewhat differently over the last several decades and, as a result, possess economic environments that respond quite differently to various types of external shocks. The main problem for assessing the economic consequences of naval forward presence is, therefore, one of deriving an operational classification of these environments.

In this regard, Jeffrey Sachs provides a good starting point for grouping countries in terms of their interaction with the global economy.⁹ Although Sachs' paper was written to provide a framework for examining the consequences of globalization for the growth potential of various parts of the world, it develops an initial country classification scheme that appears appropriate for the assessment of the manner in which naval forward presence market links, such as oil market price movements, produce a differential impact on domestic economies. As a first approximation to the world's different economic environments, Sachs develops five main groupings (table 6—1).



Endogenous growth countries. These countries are experiencing the process of self-sustaining increases in income generated mainly by technological innovation. Innovation raises national income, which in turn stimulates further innovation in a positive feedback process.¹⁰ For this group of countries, globalization should be a major spur to innovation by increasing the extent of the market. It may also concentrate innovative activity if it creates a more integrated global labor market for scientists and engineers who are then likely to aggregate in the highly innovative core economies. Most proxies of innovative activity (patents, research and development expenditures, and numbers of scientific publications) suggest a huge spurt in such activities in the 1990s. The rapid growth of labor productivity in the United States since the early 1990s also supports the notion of a surge in

innovation in line with the increasing globalization of the world economy.

On the other hand, it is not obvious that globalization is reducing or increasing this group's vulnerability to oil price shocks. The standard answer is that information-based economies use less oil per unit of GDP and, therefore, are becoming less dependent on imported energy. For example, in the case of the United States during the 1970s, oil products accounted for almost 9 percent of GDP.¹¹ Today, the figure is about 3 percent. More efficient car engines are one explanation. Another is the steady shift of the American economy to knowledge-driven activities. Also, the endogenous growth countries' flexibility and abilities to shift to alternative sources of energy in the short run presumably aid in minimizing the economic impact produced by oil price shocks. However, a good case could be made that increased globalization has created a greatly expanded set of macroeconomic linkages between these and many nonendogenous group countries who may be becoming more vulnerable to oil price shocks as they speed up industrialization. An oil-shock-induced recession in these countries could feed back to the endogenous countries, seriously affecting their economies through declining export sales. Ultimately, then, the net impact of oil price movements on the endogenous countries can only be assessed through empirical testing. But if these countries are indeed more vulnerable to oil shocks, the market stability-inducing effects of naval forward presence become more important to them.

Catching-up growth countries. This group of countries—starting with a lower level of technology and income (the “follower”)—is in the process of narrowing the income gap with the higher technology and richer countries (the “leader”) through a process of technological diffusion and capital flows from leader to follower.

While all countries enjoy some benefit from the technological growth of the leading countries, the rate at which technology diffuses from leader to follower differs sharply around the world. A region that is geographically isolated, for example, is much less likely to benefit from technological diffusion.

Two kinds of countries appear to be winners in the race in absorbing technologies from abroad. Countries with successful export-promotion policies, such as Korea and Taiwan, have earned the foreign exchange necessary to import technologies from abroad. Also, countries that have been able to attract large flows of foreign direct investment have similarly been able to upgrade technologies with particular success.

There is little doubt that successful catching-up growth involves a positive feedback process between technological diffusion and human capital accumulation. Initially, human capital is low in the laggard economy, and technologies are rudimentary. The country may achieve some modest inflow of technology by attracting labor-intensive export-oriented foreign direct investment—for example, labor-intensive assembly operations in export processing zones. These simple assembly operations generate income, some modest skills, and the resources to invest in improved education. The combination of rising skill levels and rising educational attainment leads to an upgrading of the foreign investment facilities.

As with the endogenous countries, it is impossible to say much a priori about the manner in which increased globalization is affecting the net effects on these countries produced by an oil shock. On the one hand, increased globalization has accelerated the long-term growth path of these countries (as illustrated in table 6–2),

suggesting that they may be operating at close to full potential and thus be more vulnerable to oil price increases. On the other hand, with increased diversification, these economies may be able to shift to alternative sources of energy, thus avoiding the full brunt of the external shocks. Finally, as in the case of the endogenous growth countries, oil price shocks may impact indirectly through slowing the growth of major external markets. The matter must ultimately be resolved through empirical testing and simulation.

Resource-based growth. Resource-based growth describes the process whereby an economy experiences cycles of per capita income mainly as the result of resource booms and busts. In fact, it has often been noted in recent years that natural-resource-rich economies have fared particularly badly (see table 6–2), especially in comparison to many of the resource-scarce economies. Even oil booms may have an adverse effect on oil-producing countries through the Dutch Disease mechanisms—overvalued exchange rate, increased domestic inflation, and a shift to nontrade activities.¹² However, given the Dutch Disease effect is a longer-term phenomenon, it is probably safe to conclude that at least in the case of oil producers' increased globalization, the short-run effect of an oil price increase would be positive. Given their rigidity and lack of diversification, non-oil-producing countries would most likely have declines in their incomes during periods of oil price shocks, especially with globalization increasing their dependence on foreign markets.



Malthusian decline. Malthusian decline is a process of falling per capita income caused by population pressures that outstrip the carrying capacity of the local economy—particularly in circumstances in which the country is neither innovating nor successfully adopting technologies from abroad. These countries appear to be experiencing a long-term decline in living standards that transcends the effects of terms-of-trade shocks of cyclical phenomena. Sub-Saharan Africa is the most disturbing case of an impoverished region suffering outright declines in living standards. Somewhat less dramatically, the Andean region seems also to be stocked with stagnant or even falling living standards. Given the economic structure of this group of countries, it is probably safe to assume that any trends in globalization would increase their vulnerability to oil price shocks.

Economic isolation. Economic isolation is a phenomenon of economic stagnation that results from an economy's physical or policy-induced isolation from world markets. The main problem with the landlocked countries is that their geographical

isolation sharply hinders international trade. In terms of increased globalization, foreign investors in particular do not view these impoverished nations as effective platforms for export-oriented foreign direct investment. Thus these countries are typically unable to attract the kind of assembly operations in garments, electronics, footwear, and other sectors that have been important steppingstones to economic development in more favorably located economies. Foreign investors come, if at all, only to exploit primary commodities with a high value per unit weight—such as oil and gas, diamonds, and metals—since such commodities can be profitably exploited even when transport costs are high. Without the diversification and flexibility needed to modify oil price shocks, one must conclude that these countries, unless hydrocarbon producers themselves, are very vulnerable to developments in the international oil market.

Summary. The point of identifying distinctive national economies categorized by similar characteristics is the development of a hypothesis: it is reasonable to expect that most or all countries in a particular group would be affected in a roughly similar manner by external oil shocks. Behavior following oil price shocks, of course, is our tool for analyzing the stabilizing effects of naval forward presence.

Building on this hypothesis, the next step is the development of an operational method for quantifying these country groupings and, when necessary, reclassifying countries to better reflect a common underlying set of global economic forces. The point of this analysis is to help assess the manner in which globalization has altered the structure of these countries over time with regard to making them more or less vulnerable to oil price shocks. Given the trends in globalization, this provides a rough tool to examine the question of which countries are benefiting more from naval forward presence and to what extent. Which are less affected by naval presence, and by how much?

Quantifying Globalization

One of the main hindrances to a meaningful assessment of the manner in which increased globalization affects the economic benefits associated with naval forward presence is that the term *globalization* remains vague, meaning different things to different people and groups. Currently, a consensus appears to be forming that globalization—whether economic, political, cultural, or environmental—is defined by increasing levels of interdependence over vast distances. However, a study by A.T. Kearney, Inc., notes few researchers have undertaken the task of actually trying to measure those levels of interdependency.¹³ “For instance, how do we determine the extent to which a country has become embedded within the global economy? How do we demonstrate that globalization is racing ahead, rather than just limping along?”¹⁴ The lack of a clear, precise definition underlies many of the current arguments and debates over the extent of globalization and the manner that phenomenon is changing the structure of national economies. As the Kearney study notes: “Without the means to quantify the extent of globalization, any meaningful evolution of its effects will remain elusive.”¹⁵ Foreign policy scholar James Rosenau has also outlined many of the benefits and conceptual problems of devising a meaningful operational definition of globalization.¹⁶

Previous attempts at quantification. The Kearney approach is to reverse-engineer globalization and break it down into component parts. On a country-by-country basis, Kearney quantifies the levels of personal contact across national borders by combining data on international travel, international phone calls, and cross-border

remittances and other transfers. The A.T. Kearney/*Foreign Policy* globalization index charts the World Wide Web by assessing not only its growing numbers of users but also the number of Internet hosts and secure servers through which they communicate, find information, and conduct business transactions.

The Kearney globalization index also measures economic integration; it tracks the movements of goods and services by examining the changing share of international trade in each country's economy; and it measures the permeability of national borders through the convergence of domestic and international prices. The index also tracks the movements of money by tabulating inward and outward direct foreign investment and portfolio capital flows, as well as income payments and receipts.

As the Kearney study notes, much of the conventional wisdom cherished by both champions and critics of globalization collapses under the weight of hard data—beliefs ranging from the pace and scale of global integration and the characteristics of the digital divide to the impact of globalization on income inequality, democratization, and corruption.

But while the Kearney index is a step in the right direction, it still suffers from many of the problems associated with index construction. Several fundamental problems are the choice of which measures to include in the index, the ability of these measures to be compared across countries, and the choice of which system of weights to use to combine the various measures into a final summary index. Clearly each possible (arbitrary) weighting system will provide a somewhat different picture as to the extent of globalization in any particular country. The Kearney study does not treat these issues, but they need to be addressed before the index can provide any new meaningful insights to the globalization process.¹⁷

A new approach to quantification. One way to get around this problem is to compile an extensive data set of the most widely used economic statistics and measures of world trade, such as capital flows and economic integration. Many of these measures will overlap and thus be redundant. Using factor analysis, however, the main dimensions of global diversity can be identified.

More specifically, the basic assumption of factor analysis is that a limited number or underlying dimensions (factors) can be used to explain complex phenomena. The resulting data reduction produces a limited number of independent (uncorrelated) composite measures. In the current example, measures such as value added per unit of capital, value added per laborer, value added per firm, and so on could provide a composite index of productivity or relative efficiency in factor usage. One advantage of indexes formed in this manner is that it avoids the problem of selecting one measure of efficiency—such as value added per worker—over other logical alternatives.

As an initial step in exploratory data analysis, factor analysis has three objectives: to study the correlations of a large number of variables by clustering the variables into factors such that variables within each factor are highly correlated; to interpret each factor according to the variables belonging to it; and to summarize many variables by a few factors.

The usual factor analysis model expresses each variable as a function of the factors common to several variables and a factor unique to the variable:

$$z_j = a_{j1}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + U_j$$

where

z_j = the j^{th} standardized variable

m = the number of factors *common* to all the variables

U_j = the factor unique to variable z_j

a_{ji} = *factor loadings*

The number of factors, m , should be small, and the contribution of the unique factors should also be small. The individual factor loadings, a_{ji} , for each variable should be either very large or very small so each variable is associated with a minimal number of factors.

To the extent that this factor analysis model is appropriate for the problem at hand, the objectives noted above can be achieved. Variables with high loadings on a factor tend to be highly correlated with each other, and variables that do not have the same loading patterns tend to be less highly correlated. Each factor is interpreted according to the magnitudes of the loadings associated with it.

Perhaps more important for the problem at hand, the original variables can be replaced by the factors with little loss of information. Each case (firm) receives a score for each factor; these *factor scores* can be computed as:

$$F_i = b_{i1}z_1 + b_{i2}z_2 + \dots + b_{ip}z_p$$

where b_{ij} are the *factor score coefficients*. Factor scores are in turn used in the discriminate analysis that follows. In general, these factor scores have less error and are therefore more reliable measures than the original variables. The scores express the degree to which each case possesses the quality or property that the factor describes. The factor scores have a mean of zero and standard deviation of one.

Operationally, the computations of factors and factor scores for each country are obtained through a principal components procedure. The data used in the analysis of our third study was taken from the annual World Bank World Development Indicators¹⁸ and include:

- ⌘ Domestic absorption (percentage of GDP)
- ⌘ Domestic credit provided by banking sector (percentage of GDP)
- ⌘ Expenditure, total (percentage of GDP)
- ⌘ Trade (percentage of GDP)
- ⌘ Trade (percentage of goods GDP)
- ⌘ Imports of goods and services (percentage of GDP)
- ⌘ Financing from abroad (percentage of GDP)
- ⌘ Foreign direct investment, net inflows (percentage of GDP)
- ⌘ Exports of goods and services (percentage of GDP)

- ✧ Domestic financing, total (percentage of GDP)
- ✧ Gross private capital flows (percentage of GDP, purchasing power parity [PPP])
- ✧ Telephone mainlines (per 1,000 people)
- ✧ Gross foreign direct investment (percentage of GDP, PPP)
- ✧ GDP growth (annual percentage)
- ✧ Import growth (annual percentage)
- ✧ Exports of goods and services (annual percentage growth)
- ✧ Sub-Saharan dummy
- ✧ Small country dummy
- ✧ Oil dummy
- ✧ Revised country classification

Quantified dimensions of globalization. While the exact composition of factors varied slightly from year to year over the analysis period (1985–1997), the 20 variables generally produced 5 main dimensions or factors:

Structural openness depicts the degree of national economic integration into the world economy. Operationally, this comprises the share of imports and exports as a percentage of GDP. The variables comprising structural openness do not change much over time, and this usually is the first factor to be extracted from the data set.

- ✧ *General globalization* (for lack of a better term) incorporates those variables that load on Sachs' country grouping dimension (table 6–1). The third study also expands Sachs' list of countries to include several additions, such as Brazil. The number of variables loading on this factor increases considerably over time, with the factor incorporating an increasingly diverse set of global indices. The third study makes clear that globalization affects each of the different country groupings in unique ways and that globalization is an ongoing process.
- ✧ *Finance* comprises both domestic and foreign components—for example, foreign direct investment and financing from abroad.
- ✧ *Growth/trade expansion* includes both external and internal measures of economic expansion. The main variables that make up this factor are import and export growth and overall GDP growth. GDP growth usually, but not always, is highly correlated with the measures of trade expansion.
- ✧ *Global structure* comprises several structural variables that take into account unique country characteristics identified in the literature. For example, the literature suggests that the sub-Saharan African countries may have a unique set of factors that sets them apart from other developing countries.¹⁹ To take this potential factor into account, a variable (SUBAF) was created that gives a score of zero to the non-African countries and one to the African nations.

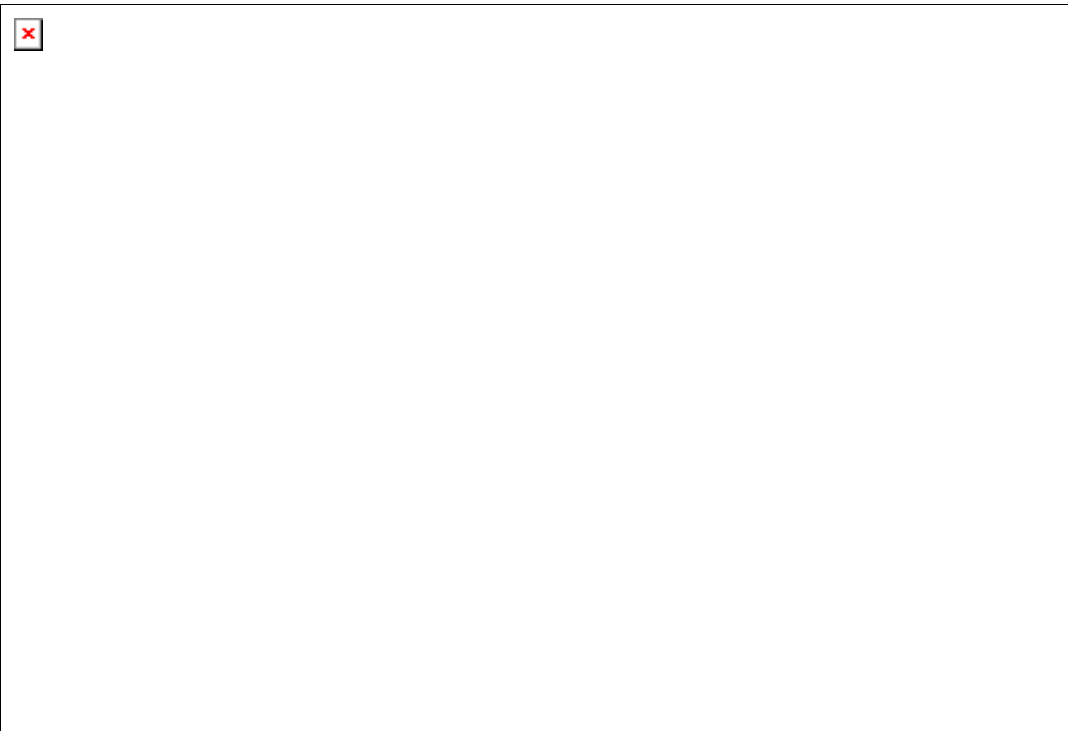
Researchers also contend that small countries, with much narrower resource bases and smaller domestic markets, are at a disadvantage in comparison to their larger counterparts.²⁰ To take this effect into account, the third study utilizes a unique variable with a value of one assigned to the smaller nations (usually those with a population less than 5 million), and a zero for the larger countries.

Finally, another body of literature stresses the unique structure of the oil economies.²¹ This factor is taken into account with a final variable entitled *oil*, which assigns a value of one to the oil economies and a zero to non-oil nations.

Revised factor scores and country groupings. Because Sachs' classification was intended to examine the growth potential of a large group of countries, his country groupings may not be ideal for the identification of differential impacts on unique

economic environments stemming from oil price shocks. Also, Sachs' classification scheme appears to be static. There is little evidence of movement between groups and no precise indication of the circumstances under which movement might take place. In the case of economic environments, we would expect discernable shifting between groups as countries and their economic policies evolve.

To overcome these limitations, the third study used the following procedure (illustrated as figure 6–1).²² First, for each individual year examined, a factor analysis was undertaken using the 20 variables noted above. In the case of 1995, 54 countries had complete data observations for this period and were retained in the analysis.²³ The 20-variable data set was comprised of 5 main dimension or factors (based on the constraint of an eigen value [characteristic root value] of one or greater).



Sachs' country classification term was included in the second factor along with gross private capital flows, export share in GDP, and gross foreign direct investment. These variables differed significantly by country grouping. The country factor scores on each dimension are based on a scale with a mean of zero. Positive numbers indicate above-normal attainment of a particular factor or global dimension, while negative values indicate that the country/group is below average in attainment of that dimension. For example, in 1995 the trade patterns of the United States accounted for a considerably smaller share of GDP than the sample norm. The United States was even well below the norm of the endogenous growth countries (group 1 of table 6–1). The United States was considerably above the sample average for its attainment of general globalization (dimension 2) but again considerably below the norm for endogenous growth countries. The United States was, however, slightly above the norm for global financial flows. Finally, the country had above-average growth during this period, again somewhat above that of the endogenous growth countries.

Second, using the country factor scores from this step, a discriminant analysis was

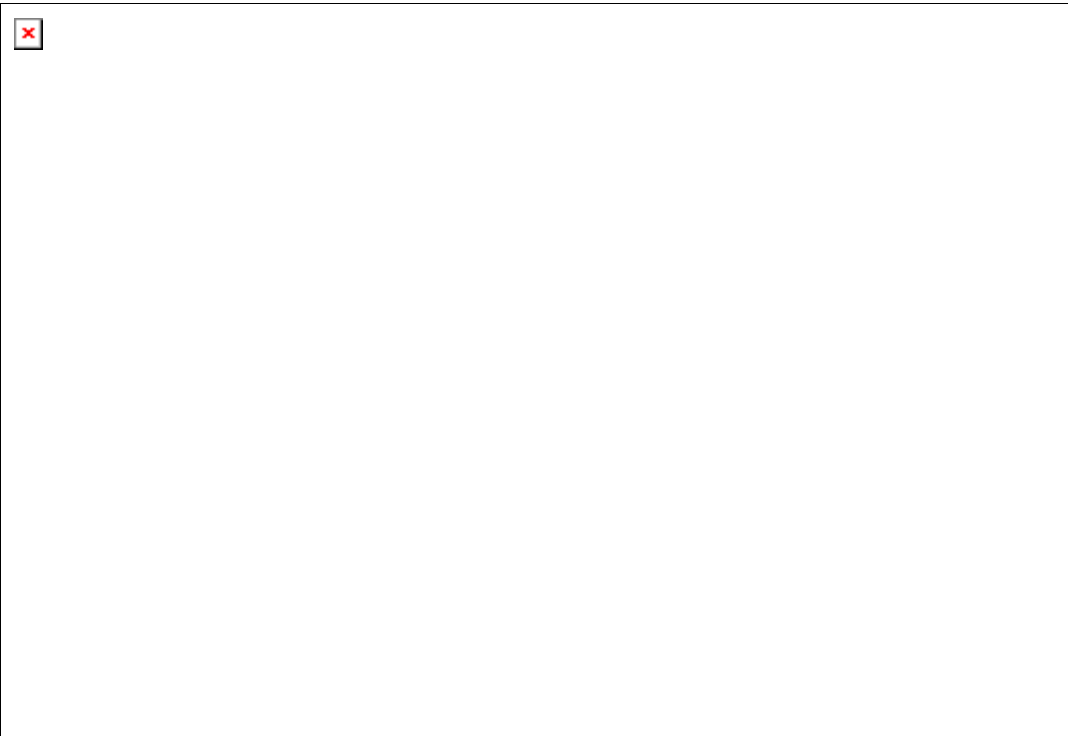
undertaken to assign a new set of country groupings. The five main dimensions of globalization noted above were weighted in reassigning countries to one of the five groups originally developed by Sachs. For the sample year of 1995, two dimensions, general globalization and trade expansion, were statistically significant in separating the sample countries into five main groupings. Of the original country classifications, 71.7 percent remained in their initial groups, with the remainder assigned to new groups. For example, Korea had only an 8.3 percent chance of being an endogenous growth (group 1) country but a 90.3 percent chance of correctly falling into the catching-up group (group 2). The point of the second step is to tailor the Sachs country classification scheme into a more dynamic analysis that can account for continuing globalization effects (that is, changes over time).²⁴

The third step entailed redefining the country classification variable from the results of the second step. Here, the factor analysis was rerun to generate a new set of factor scores, more reflective of each country's position in the total sample and in its assigned group.²⁵

Finally, using these scores, a new discriminate analysis found that the factors of general globalization and global expansion were statistically significant in assigning countries to the five group model. On this basis, the probability of correct placement in one of the five groups was 92.6 percent, with all of the endogenous growth (group 1) countries correctly placed. This last step provides the country groupings and factor scores used in the oil price impact analysis. The analysis was undertaken for 1977, 1980, 1983, and each year for the period 1985–1997.

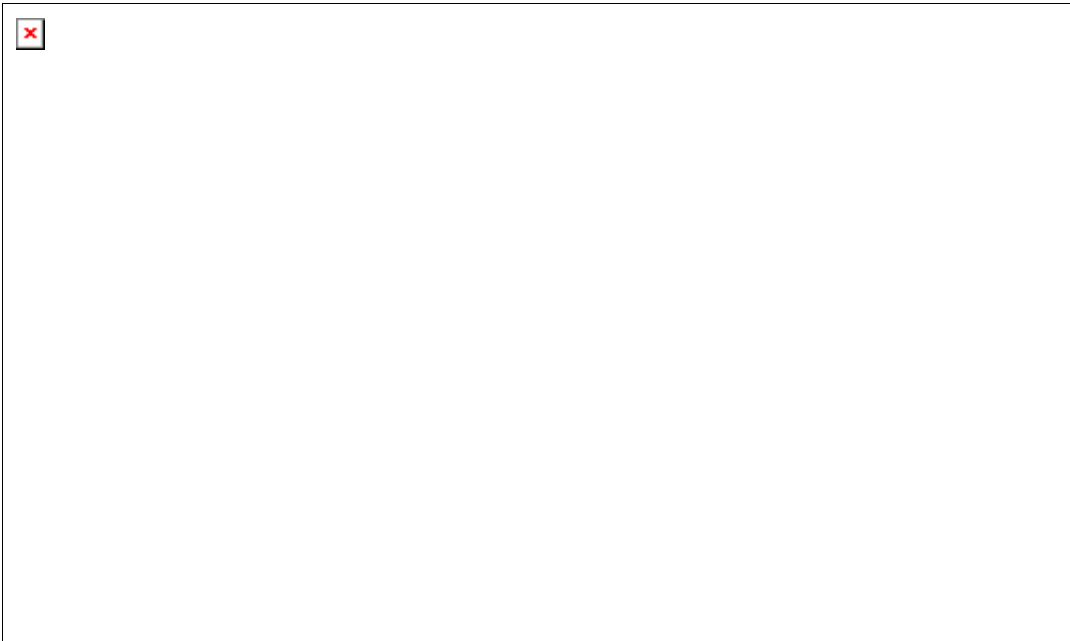
Globalization and the Strength of Oil Shocks

The revised factor scores or globalization dimensions for each country are a key element for assessing the manner in which oil price shocks have been modified over time by changes in the world economy. Using the United States as an example, the link between oil price shocks and globalization is outlined in figure 6–2.



As a starting point, a macroeconomic model was constructed for each of the 19 countries examined. In the case of the U.S. economy, the model consisted of three endogenous macroeconomic variables (gross capital formation, government consumption, and exports [all at constant dollar prices]) and three exogenous variables (Japanese constant price GDP, the dollar exchange rate, and world oil prices). A first set of simulations for each year (1985–1997) was made using the historical values for oil prices. A second set of simulations was made assuming a 10 percent increase in the price of oil for each base year. The net impact on GDP was then calculated by subtracting the simulations incorporating oil price shocks from the historical series. Oil shock impacts were calculated for the shock year and 2 subsequent years. Finally, the resulting oil shocks were put through a regression analysis on the various globalization dimensions to assess the role that changes in a country's level of globalization might have had in modifying the manner in which oil prices altered that country's GDP.

Based on these findings, implications were drawn (figure 6–3) for the likely future role of naval forward presence/crisis response. For example, if the size of oil price shocks increases over time for a particular country, then naval forward presence, by limiting the rise of oil prices, would play an increasingly important role in stabilizing that country's GDP. On the other hand, if the dimensions of globalization lessened the loss in GDP associated with oil price shocks, then naval forward presence would decline in importance in providing economic benefits to that country.



Economic Impact of Naval Forward Presence on America

Using the framework developed above, a sample of 19 countries (including the United States) was analyzed to determine the changing strength of oil price shocks. Based on the results, a number of generalizations can be drawn concerning the likely future economic role played by naval forward presence.

Patterns of globalization. The United States is far and away the world's leading economic power. Its GDP totaled \$9.3 trillion in 1999; assuming international purchasing power parity, this was 3 times the size of Japan's output, 4.8 times the

size of Germany's, and almost 7 times the size of the United Kingdom's. Although the volume of its exports and imports exceeds that of any other country, the value of the U.S. external sector as a percentage of its GDP is comparatively low. Exports of goods and services accounted for less than 11 percent of GDP in 1999, considerably less than the European Union's 25 to 29 percent in recent years.²⁶

As noted earlier, our approach focuses largely on 1985 to 1997, a period when many argue that the process of globalization began to significantly affect the world's leading economies. This provides a framework for examining a large sample of countries in such a manner that their various unique patterns of globalization could be identified and then examined as possible contributing factors to the differing impacts of oil price shocks on national economies. This in turn would contribute to identifying those countries most likely to benefit from naval forward presence/crisis response.

With these goals in mind, the factor/discriminant analysis of U. S. globalization found some significant differences between the U.S. economy and the overall norm for the endogenous growth (group 1) countries. Table 6-3 reports the factor scores on the globalization dimensions for the United States, along with the comparative scores for the overall endogenous growth (group 1) and catching-up (group 2) countries.²⁷ From the results, three patterns can be identified: U.S. structural openness dimension scores are considerably below the group average which suggest that trade plays less of a role in the American economy than for other advanced industrial nations; the U.S. general globalization dimension is also somewhat below the group norm; and U.S. financial globalization and growth in the world market are above the pattern typically found in other advanced countries.



Recent patterns of U.S. globalization (as in the other endogenous growth/group 1 countries) have been characterized by a rapid increase in the general globalization dimension (illustrated by figure 6–4). Contrary to popular belief, the United States has not dramatically increased its position relative to other countries with regard to the other dimensions of globalization—particularly global openness, financial flows, or expansion in the global economy. This finding is consistent with recent conclusions by Robert Dunn.²⁸ While Dunn’s main conclusion is that the U.S. economy is far from being completely globalized, our findings suggest that, at least with regard to the general globalization dimension, significant movement has been made in that direction.



Globalization and oil price shocks. With regard to the impact of oil price shocks on its economy, the United States has the normal pattern of a positive sign (indicated in table 6–4) associated with increased levels of general globalization. Over time, and everything else being equal, oil price shocks have been stronger because of globalization, and there has been a significant increase in the amount of GDP loss associated with oil price shocks (illustrated in figures 6–5 and 6–6).





Implications for naval forward presence. The above finding suggests that in the absence of offsetting effects produced by the other dimensions of globalization, future naval forward presence should be increasingly important to the U.S. economy by dampening oil price increases caused by destabilizing events.

Economic Impact of Naval Forward Presence on Other Countries

A similar analysis was undertaken in the third study for 18 additional countries whose selection was largely dictated by the available data. Here, the analysis found clear linkage between the globalization-defined country groupings and the manner in which oil shocks affect their economies (illustrated in table 6–5). Over time, and contrary to popular opinion, endogenous growth (group 1) countries have become more vulnerable to oil price shocks. The oil shock-driven loss in income as a percent of GDP has increased gradually over time and in line with the process of globalization. In other words, a 10 percent increase in the price of oil today would cause greater reductions in national income than it would in previous years. For endogenous growth countries (advanced economies), general globalization and structural openness have been the factors most responsible for the increased severity of oil shocks. Neither of these factors is easily controlled by governments without considerable damage to economic growth. Changes in the factors of financial globalization and in the global growth dimension of globalization have played a much smaller role.²⁹ In fact, increases in these factors have made some countries less vulnerable and others more vulnerable—with no clear patterns emerging from these aspects of globalization.



Because naval forward presence/crisis response tends to suppress oil shocks and return prices to their equilibrium levels, the role of such naval activities should be of increasing benefit to all endogenous growth countries, as well as all industrialized countries seeking to enter that category. With the likely continuation of global trends, naval forward presence/crisis response should play an even greater positive role for global economic stability in the foreseeable future.

Of course, this economic stability may not benefit individual oil-producing states. The two oil economies included in the study, Mexico and Norway, would likely experience declines in income associated with forward deployed naval operations—even as such operations benefit their national security interests. On the other hand, movements in globalization have resulted in Norway obtaining diminishing economic gains from oil price shocks, while Mexico's gains have stabilized rather than increased.

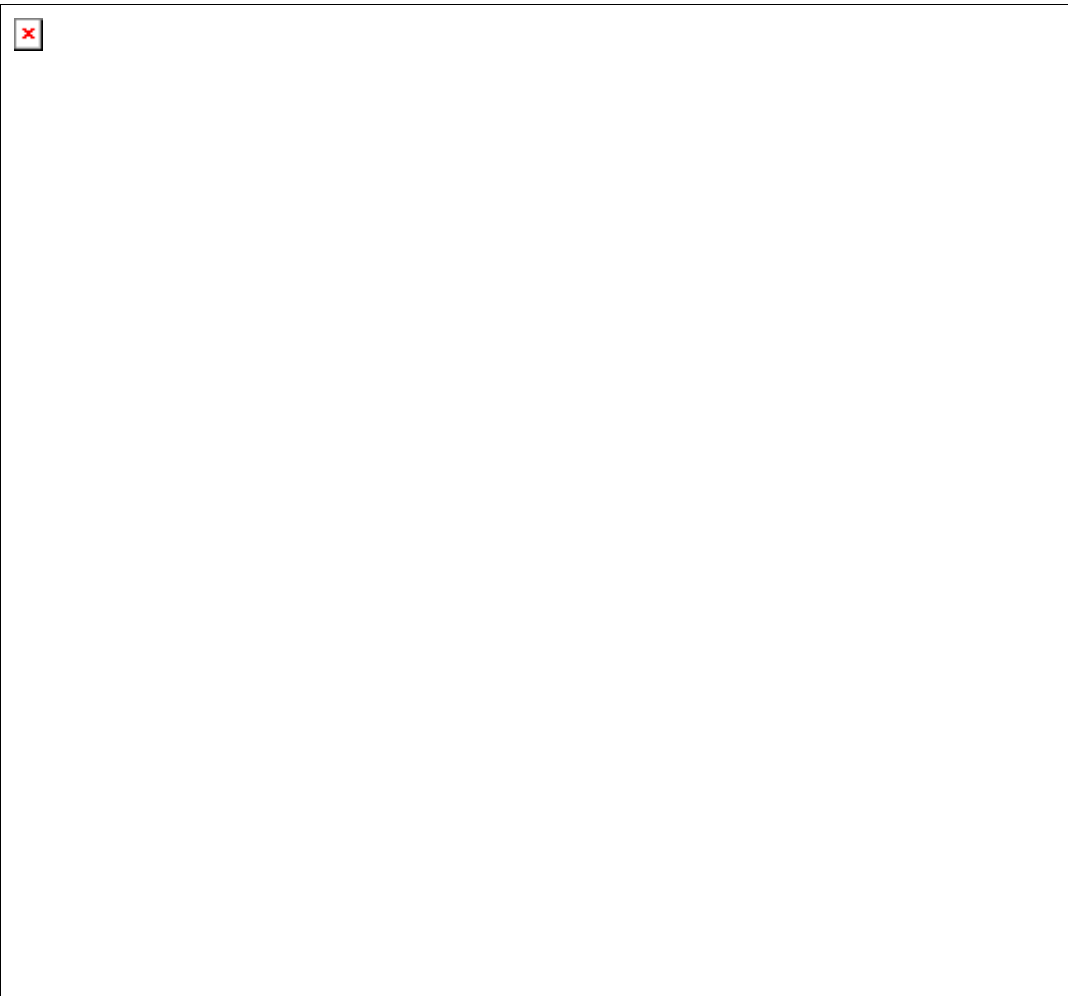
A very different globalization/oil shock pattern characterizes the catching-up countries (group 2). Over time, increases in the factor of general globalization have lessened the impact of oil price shocks on these countries, while trends in the financial dimension have worked to increase their severity. The net effect is that countries such as the Philippines, Portugal, and South Africa have experienced a gradual increase in the severity of oil price shocks. In Korea's case, the forces of globalization have appeared to neutralize each other. But the net effect has still been a rather constant loss in national income associated with oil price shocks. Given

these patterns, naval forward presence/crisis response should continue to play an important role (but a less critical role than for group 1 countries) in stabilizing the national economies of group 2 countries.

Summary and Conclusions

The findings of all three Naval Postgraduate School studies (1997, 2000, 2001), combined with anticipated trends in globalization, suggest that the Navy's forward presence is more than likely to produce economic benefits to the United States and the other major industrial economies in the years to come. Increased integration of markets should aid in transmitting the Navy's stabilizing effect on markets.

Figure 6–7 conceptualizes and summarizes the effect of naval forward presence as a factor in our refined globalization model.



It is likely that increased world trade and increased economic growth associated with globalization will place a growing demand on oil supplies—creating, in turn, the chance of more volatile oil shocks associated with crises around the world. Statistical evidence indicates that endogenous growth countries (such as the United States) sustain the greatest economic damage when oil price shocks occur. These are also the countries that fuel overall global economic growth. That fact, in itself, increases the positive economic impact of naval forces during forward-deployed naval operations. Similar arguments can be made for the effects on the share and foreign exchange markets.

Summing up, the third study's findings confirm and reinforce our original findings as to the significant and positive economic impacts associated with naval forward presence and crisis response. We have now examined seven cases and in each found benefits of at least \$1 billion (over \$50 billion in the Gulf War) to the U. S. economy. The third study's categorization of globalization and assessment of globalization factors indicate that, with regard to globalization, naval actions are seen to complement the positive impact that increased globalization has had on the American economy. In addition, it is argued that naval forward presence and crisis response tended to strengthen the process of globalization by providing stability and security for markets. Increased integration of markets should aid in transmitting the Navy's stabilizing effect on markets, while naval presence should aid in speeding up the process of globalization, which in and of itself is providing significant benefits to the American economy.

The statistical findings presented by the series of studies confirm many of the educated guesses made in earlier assessments concerning the links between naval actions, markets, and the U.S. economy. Likely changes in the various facets of globalization should strengthen the economic impacts of naval forward presence and crisis response. In turn, the stability provided by naval forward presence should assure continued deepening of the globalization process. This would set up a virtuous or self-replicating cycle that would reinforce itself over time.

Robert E. Looney is professor of national security affairs at the Naval Postgraduate School. An economist, he is the author of numerous studies on the oil-based economies of the Arabian Gulf region. This chapter is based on the report "Economic Impact of Naval Forward Presence: Benefits, Linkage, and Future Prospects as Modified by Trends in Globalization" by Robert Looney, David Schrady, and Douglas Porch (Monterey, CA: Naval Postgraduate School, December 2001). It also summarizes the results of two previous studies conducted at the Naval Postgraduate School: Ron Brown, Siriphong Lawphongpanich, Robert Looney, Daniel Moran, David Schrady, James Wirtz, and David Yost, "Forward Engagement Requirements for U.S. Naval Forces: New Analytical Approaches" (July 1997) and Robert Looney and David Shrady, "Estimating Economic Benefits of Naval Forward Presence" (September 2000).

Notes

¹ For example, see discussions in Sally Newman, "Political and Economic Implications of Global Naval Presence," in Dan Goure and Dewey Mauldin, *Naval Forward Presence: Present Status, Future Prospects* (Washington, DC: Center for Strategic and International Studies, November 1997), 47–59; and Sam J. Tangredi, "The Fall and Rise of Naval Forward Presence," U.S. Naval Institute *Proceedings* 126, no. 5 (May 2000), 29–32. [BACK](#)

² This assumes the accuracy of the argument that the U.S. Navy has become "the global navy" (with benefits to the overall international community) identified in chapter 1. [BACK](#)

³ Anecdotal studies include: System Planning Corporation, *Political and Economic Implications of Global Naval Presence*, Report for the Office of the Deputy Chief of Naval Operations, September 30, 1996; Sally Newman, "Political and Economic Implications of Global Naval Presence;" and various papers produced by Kapos Associates, Inc. A suggestive editorial is "Oil Prices and the Navy," *The Washington Post*, May 4, 1988, 22. [BACK](#)

⁴ Summarized in Robert E. Looney, David A. Schrady, and Ronald L. Brown, "Estimating the Economic Benefits of Forward-Engaged Naval Forces," *Interfaces* (July 2001), 74–86. [BACK](#)

⁵ C. Sims, "Large Scale Econometric Models," *Econometrica* (January 1980), 1–4. [BACK](#)

⁶ Anthony E. Boop and George M. Lady, "A Comparison of Petroleum Futures versus Spot Prices as Predictors of Prices in the Future," *Energy Economics* (October 1991), 274–282. [BACK](#)

⁷ M. Hashem Pesaran and Bahram Pesaran, *Working With Microfit 4.0: Interactive Econometric Analysis* (Cambridge: Camfit Data, 1997). [BACK](#)

⁸ Amartya Sen, "If It's Fair, It's Good: 10 Truths About Globalization," *International Herald Tribune*, July 14, 2001. [BACK](#)

⁹ Jeffrey Sachs, "Globalization and Patterns of Economic Development" *Weltwirtschaftliches Archiv* 136, no. 4 (2001). [BACK](#)

¹⁰ Robert Lucas, "On the Mechanics of Economic Development," *Journal of Monetary Economics* (July 1988), 3–42; Paul Romer, "Endogenous Technical Change," *Journal of Political Economy* (October 1990), s71–s102; Paul Romer, "Increasing Returns and Long Run Growth," *Journal of Political Economy* (October 1986), 1002–1037. [BACK](#)

¹¹ Irwin Stelzer, "Oil Loses Power to Drive Boom off Course," *London Times*, January 23, 2000. [BACK](#)

¹² Robert E. Looney, "Oil Revenues and the Dutch Disease in Saudi Arabia: Differential Impacts on Sectoral Growth," *Canadian Journal of Development Studies* 11, no. 1 (1990), 119–133. [BACK](#)

¹³ A.T. Kearney, Inc./*Foreign Policy Magazine*, "Measuring Globalization," *Foreign Policy* (January/February 2001), 56–65. [BACK](#)

¹⁴ *Ibid.*, 56. [BACK](#)

¹⁵ *Ibid.* [BACK](#)

¹⁶ James Rosenau, "The Dynamics of Globalization: Toward an Operational Formulation," *Security Dialogue* (September 1996), 247–262. [BACK](#)

¹⁷ For other problems associated with the Kearney index, see Ben Lockwood, *A Note on the Robustness of the Kearney/Foreign Policy Globalization Index*, GSR, University of Warwick Working Paper No. 79.01, August 2001. [BACK](#)

¹⁸ World Bank, *World Development Indicators, 2000* (Washington, DC: World Bank, 2000). [BACK](#)

¹⁹ D. Bloom and Jeffrey Sachs, "Geography, Democracy, and Economic Growth in Africa," *Brookings Papers on Economic Activity*, no.2 (Washington, DC: The Brookings Institution, 1998), 207–289. [BACK](#)

²⁰ Robert E. Looney, "The Viability of Arab Gulf Industrial Development: The Relative Importance of Linkages versus Size Effects," *Economia Internazionale* (July/August 1991), 228–243. [BACK](#)

²¹ Robert E. Looney, "Real or Illusionary Growth in an Oil Based Economy: Government Expenditures and Private Sector Investment in Saudi Arabia," *World Development* (September 1992), 1367–1376. [BACK](#)

²² An illustrative example using 1995 as a typical year is presented in annex D of Robert E. Looney, David Schrady, and Douglas Porch, *Economic Impact of Naval Forward Presence: Benefits, Linkage, and Future Prospects as Modified by Trends in Globalization* (Monterey, CA: Naval Postgraduate School, December 2001), 199–219. [BACK](#)

²³ Ibid., 199. [BACK](#)

²⁴ Ibid., 217. [BACK](#)

²⁵ Ibid., 209. [BACK](#)

²⁶ Ibid., 121–124, contains a discussion of the effects of the *new economy* on overall U.S. economic conditions. [BACK](#)

²⁷ These factor scores are, in effect, an index formed from the weighted average of the most important elements entering into a dimension. They have a mean of zero, with positive numbers indicating an above average attainment of the country/group on that dimension. Negative scores are indicative of below average attainment of that dimension. [BACK](#)

²⁸ Robert M. Dunn, Jr., “Has the U.S. Economy Really Been Globalized?” *Washington Quarterly* (Winter 2001), 53–64. [BACK](#)

²⁹ The two group 1 exceptions are Spain and Japan, where financial flows have lessened somewhat the severity of oil price shocks. Nonetheless, oil price shocks still inflict considerable economic losses on these countries assuring an important role for naval crisis response. [BACK](#)

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